

WE CLAIM:

1. A method for forming interconnects, comprising:

5 providing a silicon substrate containing one or more electronic devices;

forming a first dielectric layer over said silicon substrate;

10 forming a second dielectric layer over said first dielectric layer wherein the dielectric constant of the second dielectric layer is less than 3.0;

15 forming a first hardmask layer over said second dielectric layer;

forming a second hardmask layer on said first hardmask layer wherein said second hardmask layer comprises a material selected from the group consisting of titanium
20 aluminide (TiAl), titanium aluminum nitride (TiAlN), titanium nitride (TiN), aluminum nitride (AlN), tantalum aluminide (TaAl), and tantalum aluminum nitride (TaAlN);

forming a trench in said second dielectric; and

SUB
A1

TOP SECRET

filling said trench with a conducting material.

2. The method of claim 1 wherein said second dielectric
5 layer is OSG.

3. The method of claim 1 wherein said conducting material
is copper.

10 4. The method of claim 1 wherein the material used to form
the first hardmask layer is selected from the group
consisting of silicon carbide and silicon nitride.

FOI 2004-090701

5. A method for forming interconnects, comprising:

providing a silicon substrate containing one or more electronic devices;

5

forming a first dielectric layer over said silicon substrate;

forming a second dielectric layer over said first dielectric layer wherein the dielectric constant of the second dielectric layer is less than 3.0;

10

forming a first hardmask layer over said second dielectric layer;

15

forming a second hardmask layer on said first hardmask layer wherein said second hardmask layer comprises a material selected from the group consisting of titanium aluminide (TiAl), titanium aluminum nitride (TiAlN), titanium nitride (TiN), aluminum nitride (AlN), tantalum aluminide (TaAl), and tantalum aluminum nitride (TaAlN);

20

etching a first opening in said second hardmask layer of a first width;

forming a first trench of a second width in said second dielectric layer wherein said second width is less than said first width;

5

etching a second opening in said first hardmask layer of a first width;

forming a second trench of a first width in said second dielectric layer wherein said second trench is positioned over said first trench; and

filling said first and second trench with a conducting material.

15

6. The method of claim 5 wherein said second dielectric layer is OSG.

7. The method of claim 5 wherein said conducting material is copper.

20

8. The method of claim 5 wherein said first hardmask is a material selected from the group consisting of silicon nitride and silicon carbide.

9. A method for forming interconnects, comprising:

SUB 7
A3
5 providing a silicon substrate containing one or more
electronic devices;

forming a first etch stop layer over said silicon
substrate;

10 forming a first dielectric layer over said first etch
stop layer wherein the dielectric constant of the first
dielectric layer is less than 3.0;

FORMING STOP LAYER
15 forming a second etch stop layer over said first
dielectric layer;

forming a second dielectric layer over said first etch
stop layer wherein the dielectric constant of the second
dielectric layer is less than 3.0;

20

forming a first hardmask layer over said second
dielectric layer;

A37
forming a second hardmask layer on said second first
hardmask layer wherein said second hardmask layer comprises
a material selected from the group consisting of titanium
aluminide (TiAl), titanium aluminum nitride (TiAlN),
5 titanium nitride (TiN), aluminum nitride (AlN), tantalum
aluminide (TaAl), and tantalum aluminum nitride (TaAlN);

etching a first opening in said second hardmask layer
of a first width;

10 forming a first trench of a second width in said
second dielectric layer wherein said second width is less
than said first width;

15 etching a second opening in said first hardmask layer
of a first width;

forming a second trench of a first width in said
second dielectric layer wherein said second trench is
20 positioned over said first trench;

simultaneously etching said second trench to a depth
of said second etch stop layer and said first trench to a
depth of said first etch stop layer; and

A³7

filling said first and second trench with a conducting material.

5 10. The method of claim 9 wherein said first dielectric layer is OSG.

11. The method of claim 9 wherein said second dielectric layer is OSG.

10

12. The method of claim 9 wherein said conducting material is copper.

15

13. The method of claim 9 wherein said first hardmask is a material selected from the group consisting of silicon nitride and silicon carbide.

FOUO 44-38860